International Journal of Sciences: Basic and Applied Research (IJSBAR)

ISSN 2307-4531
(Print & Online)

http://gssrr.org/index.php?journal=JournalOfBasicAndApplied

Impact of Industrial with Farmers Partnership Against Cocoa Cultivation Practices in the Luwu Region, South Sulawesi

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Abstract

This research aimed to analyzed the impact of industrial with farmers partnership against cocoa cultivation practices in the Luwu region, South Sulawesi. The collection of research data conducted by in-depth interviews using the technique of key informants approach. Key informants were used in this study is the head of the farmer group of partners and non-partners in the area of research, and industry representatives are doing partnerships with cocoa farmers. The results showed that partnerships of industrial with cocoa farmers in the development of the cocoa upstream industry in the region Luwu, an impact on the improvement of cocoa cultivation practices. Cocoa partnership activities have increased the awareness of farmers in the use of quality seeds, application of monoculture cropping systems, and the application of the ideal planting distance.

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The used of cover crops, the right fertilizer and pruning activities have been implemented in cocoa partnership activities in the Luwu region. Another positive impact of the implementation of this cocoa partnership is a reduction in chemical use in pest and disease control cocoa plants.

Keywords: partnerships; industrial; cocoa farmers; cultivation practices.

1. Introduction

Cocoa development in the upstream sector is not as fast as with the development of cocoa in the downstream sector. The success of the cocoa industry in the downstream sector is not followed by an increased in production in the upstream sector. If this is not corrected, then the supplay of raw materials for industry kakoa seed will be a deficit. Therefore, the Indonesian government attempts to optimized the development of cocoa in Indonesia, especially in South Sulawesi, through the industrialization of cocoa from upstream to downstream. This effort to ensure the sustainability of cocoa farming and industry.

One of the efforts undertaken by the South Sulawesi government in improving the productivity and quality of cocoa by developing a pilot project of 800 hectares in two districts of Soppeng and Luwu. Through this project is expected in South Sulawesi will become a center of sustainable cocoa in Indonesia, to be a cocoa-producing region of quality, sustainable, and environmentally friendly in 2020 [1].

The government is also to encourage and facilitate private sector both exporters and cocoa processing industry to participate in developing the cocoa farmers through partnership activities in the development of cocoa upstream industries. The development of the cocoa upstream industry through industry partnerships with cocoa farmer is expected to be a liaison mutual interest mutualistic nature. Implementation goals of the cocoa partnership generally focused on the training of better agricultural practices by farmers and linking farmers directly to international buyers [2]. Participation of the private sector through partnerships with farmers required to support the development of cocoa plantations. The role of the private sector in these partnerships, especially in terms of input supply, technical and extension support and the development of effective marketing system, to improve the cocoa marketing [3]. This study was conducted to analyze the impact of industrial with farmers partnership to plant cocoa cultivation practices in the area of Luwu, South Sulawesi.

2. Research methods

2.1. Location and Time of Research

The study was conducted in November 2014 to August 2015. The study was conducted in the area of cocoa upstream industrial development in South Sulawesi, namely Luwu, North Luwu and East Luwu Distric. The company cocoa partnership with cocoa farmers as research objects are: PT. Mars Symbioscience Indonesia, PT. Olam, PT. Tanah Mas Celebes Indah, PT. Comextra Majora, and PT. Bumi Tangerang Mesindotama.

2.2. Data Source

The data used in this study included primary and secondary data. The primary data obtained through interviews

with key informants with the help of a structured questionnaire. The informant in this study are representative of partner and non-partner farmers, and industry representatives. While secondary data obtained from relevant agencies and data from previous studies associated with this research.

2.3. Data Collection Technique

The data collection is done by depth interview using the key informant approach. This approach is a technique to collect data through certain people are seen as leaders, decision makers or also regarded as the spokesman of a group or community which is the object of observation, and the person is considered to be able to provide accurate information in identifying problems in the community [4].

In this study, key informants who selected them is the head of the farmer group of partners and non-partners, Manager of each company that does the cocoa partnership. Selection of key informants was based on the assumption that they are the ones who know and have in depth experience related to the development of the upstream cocoa industry through a partnership model.

2.4. Data Analysis

The data were analyzed using one-way ANOVA test using SPSS program. Presentation of data in tables and graphs processed using Microsoft Excel program.

3. Results and Discussion

3.1. Land Conditions, Population and Age of Cocoa

Plantations is a major production in cocoa farming. Results of analysis of variance average area of cacao plantations owned by the farmers indicate that the land area partners farmers significantly different with area non-partner farmers, where the partners farmers land wider 4% when compared to non-partner farmers. This difference is caused by several things, one of which is the lack of capital to expand the land automatically also requires more labor. Partner farmers who have larger farms would require substantial capital to carry out of cocoa farming. Thus through the partnership, the partner farmers are being helped by their access to loan capital through loans and aid production facilities obtained from partner companies. In general, the area of land owned by cocoa farmers in the region of Luwu still higher than the average area of land owned by cocoa farmers a nationally. The majority of land ownership in Indonesian cocoa farmers only average 1.03/ha [5].

Table 1: Land condition, population and age of cocoa in Luwu

Parameter	Minimum		Maximum		Mean	
	Partner	Non-Partner	Partner	Non-Partner	Partner	Non-Partner
Land area (Ha)	0.75	0.25	4.00	3.60	1.9±1.0[b]	1.3±0.8[a]
Cocoa Population (tree)	400	150	3200	2928	1702±894[b]	1031±680[a]
Age of cocoa (years)	2.5	2.0	20.0	21.0	11.0±6.9[a]	12.1±5.8[a]

Different superscript letters in the same row indicate significant differences at the levelof $p < 0.05$

The land area of the farmers affect the cocoa populations cultivated on the land. It is shown from the data cocoa population cultivated by partner more than the population of cocoa cultivated by non-partner. In addition to the seeds quality and cultivation techniques, the age of cocoa also greatly affect the productivity of cocoa trees. The average age of cocoa farmers are partners ±11 years, while the non-partner farmers had an average age of cocoa ±12.1 years. Based on data from the age of cocoa in the region of Luwu, which is getting old, it is necessary to replanting cocoa to replace plants that have been older.

3.2. Cocoa cultivation conditions

Seed is one of the requirements is absolutely necessary in the system of cultivation. The use of quality seeds is the right choice of farmers for planting. But there are things that hinder farmers to obtain quality seeds, for example, access to quality seeds is difficult, lack of capital to buy because the price is more expensive than local seeds, and others.

Data showed that the quality seeds is a type of seed most widely used by partner and non-partner farmers. However, there is still a small proportion of partners using local seeds, and there are also some non-partner farmers who combine both types of seeds, namely local and quality seeds. Partner farmers more used of quality seeds compared to non-partner farmers. This is possible because of the ease of access for partner farmers to get quality seeds from the partner company.

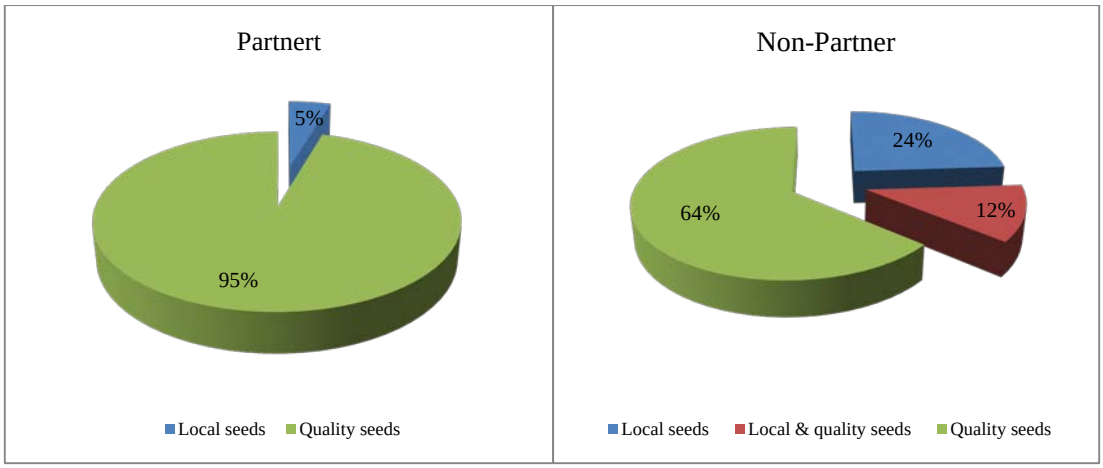

Figure 1: The type of seeds used by farmers in the Luwu region

Sources of seeds used by farmers in Luwu region came from several sources that the Department of Plantations, merchants, fellow farmers, reproduced itself. There are also farmers who earn more than two sources. Most seed sources used by farmers is the Department of Plantations, these seeds are usually the assistance of government obtained by any cocoa farmers. While the source of seed fewest obtained from merchants (Figure 2).

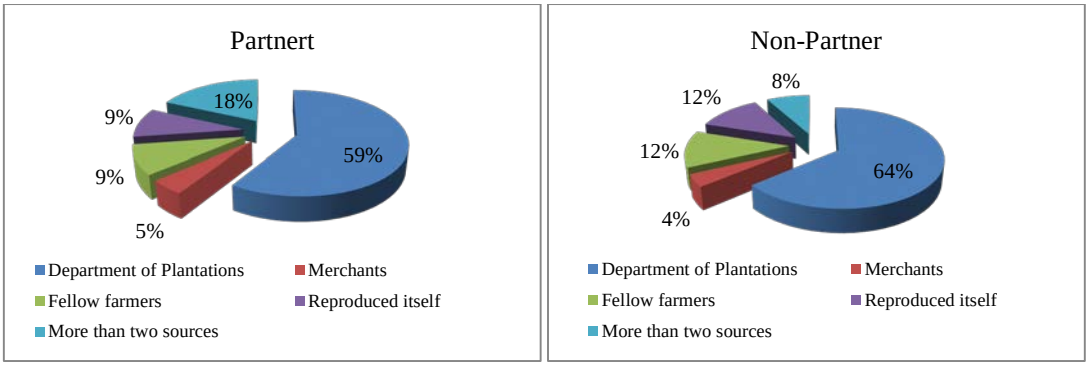

Figure 2: Sources of seeds used by farmers in the Luwu region

In planting the cocoa crop, partners farmer apply more monoculture systems than intercropping system, whereas non-partner farmers who apply the system of monoculture and intercropping is almost the same amount. This showed that the majority of farmers in the Luwu region have implemented good cultivation systems is mainly a partners.

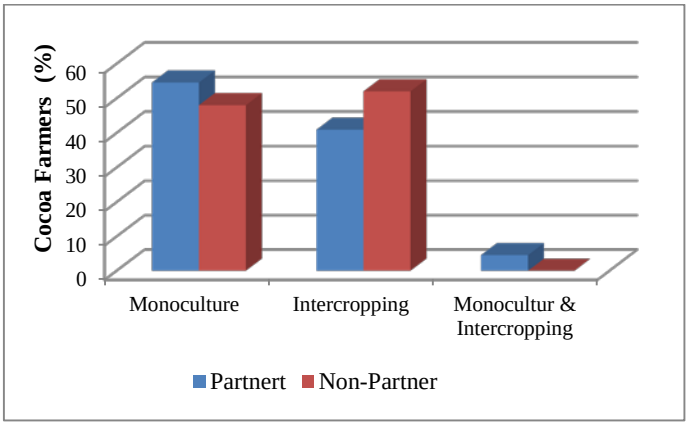

Figure 3: The planting system applied by farmers in the Luwu region

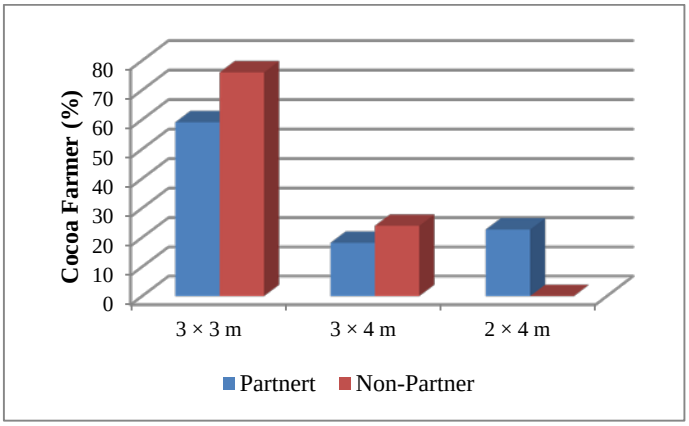

Figure 4: The planting distance applied by farmers in the Luwu region

Figure 4 showed that the majority of farmers applying spacing of 3 × 3 m. Application of plant spacing is

adapted to land conditions and the growth of the cocoa plant. The ideal spacing for cocoa is the distance that corresponds to the development of parts of the plant canopy as well as the availability of enough space for root development. Selection of planting distance is closely related to the nature of plant growth, seedling and soil fertility. Planting cocoa with a spacing of 3 × 3 m can make efficient use of land, as the number of cocoa trees can be planted in one hectare of land can reach 1,100 trees. Although the spacing of 2 × 4 m, the number of cacao trees that can be planted in one hectare of land higher at 1,250 trees [6], but farmers in the area Luwu not much apply planting distance, because if cocoa is grown dense enough will affect the growth and production of cocoa plants.

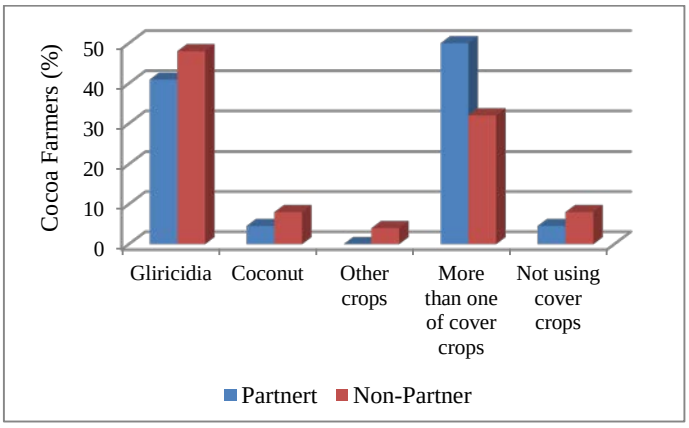

Figure 5: The types of cover crops applied by farmers in the Luwu region

In addition to plant spacing, use of cover crops on cocoa cultivation is very important to note. The cultivation of cocoa plants require cover crops are that serve to reduce the intensity of irradiation, pressing the maximum temperature and evapotranspiration rate, as well as protect the plants from strong winds. In other words, the cover crops acts as a buffer environmental factors unfavorable for the growth of the cocoa plant [6]. The most farmers in Luwu region have realized the importance of the use of cover crops in maintenance of the cocoa plant (Figure 5). This is evidenced by the research data shows that only a small portion of cocoa farmers who do not use cover crops in the cultivation of cocoa. Types of cover crops are that are widely used by farmers in the region Luwu is *Gliricidia* plants and coconut, as well as combinations of *Gliricidia* plants, palms and other plants such as bananas and cassava. The use of *Gliricidia* plants as cover crops are in the cultivation of cocoa is widely used, because this plant is very easy to grow and resistant to pests and diseases. Besides, *Gliricidia* leaves of the plant can be used by cocoa farmers as feed for livestock such as goats and cows. The results also showed that there is only one farmer who still use lamtoro plants as cover crops, and even then combined with *Gliricidia* plants. Lack of cocoa farmers who use lamtoro as cover crops for their psyllid pests on lamtoro. The authors in [6] noted that concerns the planting of shade trees lamtoro kind of late related to the discovery of the Heteropsylla sp on the habitat of these plants, which could lead to protective tree bare lamtoro thus losing its function.

3.3. Fertilization

Fertilization is done with the aim of increasing their nutrient elements are lacking or not available in the soil and

replace the soil nutrients that have been exploited by the cocoa plant during cultivation and plant remains preserved [7, 8, 9]. In the process of fertilization required precision in selecting the type of fertilizer, fertilizer application period, fertilization method and reliable source of fertilizer. In addition, the dosage of fertilizer should also be appropriate. It depends on the condition and age of the cocoa plant, soil conditions (pH of the soil), the environmental conditions, the amount of canopy and the others.

Table 2: Type of fertilizer, fertilizer application period, and fertilization method

Parameter	The number of farmers who applied (%)	
	Partnert	Non-Partnert
Type of Fertilizer		
• Urea	0.00	8.00
• NPK	31.82	16.00
• More than one type of fertilizer	68.18	76.00
Fertilizer Application Period		
• 1 time, early or end of the rainy season	0.00	4.00
• 1 time, early or end of the rainy season after pruning	4.55	16.00
• 2 times at the early or end of the rainy season	27.27	20.00
• 2 times at the early or end of the rainy season after pruning	68.18	60.00
fertilization method		
• Distributed under the plant canopy	0.00	32.00
• Flow circular under the plant canopy	22.73	4.00
• Flow circular and in close below the plant canopy	45.45	48.00
• In the stump around the base of the stem	22.73	16.00
• More than one of fertilization method	9.09	0.00

The cocoa farmers both partner and non partner generally use more than one type of fertilizer ie. urea, ZA,

SP36, NPK, manure, PPC, dolomite and agricultural Calcium (Table 2). Among the several types of fertilizers, the farmers more combine urea, ZA, SP36 and NPK. The combined use of these fertilizers because the content of the fertilizer can meet the growing needs of cocoa and increase nutrients in the soil. Generally cocoa plant fertilization using a urea or ZA as a source of Nitrogen, TSP fertilizer as a source of Phosphor, and KCl fertilizer as a source of Calcium. The organic fertilizers can be added on the cocoa crop fertilization [8].

The appropriate use of fertilizers can increase crop yields [10]. Similarly, the use of fertilizers are effective on the cultivation of cocoa plants will help not only to improve yields, but also can have an impact on profitability, cocoa bean quality and environmental protection [11].

Periods of fertilizer in the cocoa cultivition should be noted that the cocoa growing faster and increasing the amount of cocoa production. Implementation period of fertilizer on crops vary greatly, but the period of fertilizer most widely performed by cocoa farmers is fertilizer with two times at the beginning or end of the rainy season after pruning.

This is done because of the time a good fertilization should be done at the beginning and end of the rainy season, ie, after weeding or pruning [7].

Fertilization methods should also be considered in the maintenance of the cocoa plant, because of the fertilization methods will determine the effectiveness of fertilizers on crops. Inaccuracies in making fertilizer can reduce the effectiveness of the plant so that the production is not optimal [8].

The results showed that application of cocoa fertilizer by farmers generally with a circular groove and in close below the plant canopy. This is done because otherwise the cap will occur evaporation of the elements contained by fertilizer and easily carried away by water when it rains.

The cacao crop fertilization is done by a circular groove under the plant canopy. Fertilizing with a circular groove is done by placing the fertilizer in a circular groove under the plant canopy, and then closed again [12].

3.4. Pruning

Pruning is one of the techniques of cultivation which is important especially for cocoa plants. Pruning is the cutting activities that form part of the cacao tree branches, twigs and leaves that are not required by the cocoa plant that this part can be the place where the cocoa pods.

Prunning of the cacao plant aims to establish the basic framework (branch cocoa crop was good and strong), regulate the entry of sunlight into the garden evenly so that the plant is more productive of photosynthesis, accelerate and improve and produce flowers and fruits are many, cut the branch pests/diseases, damaged/broken, to reduce the risk of developing pest [13].

Pruning techniques there are several kinds: shape, maintenance and production pruning aimed at spurring the growth of flowers and fruit [14].

Table 3: Pruning implementation on the cocoa crop

Pruning implementation	The number of farmers who applied (%)	
	Partnert	Partnert
• One time	0.00	8.00
• Twice	68.18	52.00
• Three times	0.00	8.00
• More than three times	31.82	32.00

The research data showed that farmers in the Luuwu region have realized the importance of pruning activities is done to the cocoa crop. This is demonstrated by the data, which most farmers do the pruning with pruning period an average of two times a year (Table 3). The production prunning is done twice a year, in late dry season or early rainy season and at the end of the dry season. In addition, there are also farmers who perform prunning more than three times a year [14]. This is done because of the growth of the cocoa plant owned by farmers is very fast, so that the branches and twigs of cocoa quickly grow.

3.5. Pest and Disease Control

One of the issues contained in the cultivation of these plants are pests and diseases. Pests and diseases of cocoa can lead to lower crop yields or even death to the cocoa crop. The damage to that caused by insect pests and diseases can cause a decrease in the production of cocoa pods [7]. It is necessary for proper handling or control of pests and diseases that do not damage the cocoa plant.

The most cocoa farmers are already doing pest control on cocoa, especially on controlling of cocoa pod borers, stem borers, and *Helopeltis* (Table 4). The cocoa borers and *Helopeltis* spp. is a major pest of cocoa plants that are often found in almost every center of cocoa plantations in Indonesia [15].

Table 4: Control of the cocoa crop pests

Types of Pest and Controlling	The number of farmers who applied (%)	
	Partnert	Partnert
Cocoa pod borers		
- Physical	31.82	20.00
- Biological	13.64	0.00

- Chemicals	18.18	40.00
- Physical & Chemicals	36.36	40.00
Stem borers		
- Not Applied	0.00	8.00
- Mechanical	22.73	12.00
- Biological	18.18	4.00
- Chemicals	22.73	56.00
- Mechanical & Biological	9.09	0.00
- Mechanical & Chemicals	27.27	20.00
Helopeltis		
- Not Applied	18.18	28.00
- Biological	45.45	12.00
- Chemicals	36.36	60.00
Rats		
- Not Applied	22.73	32.00
- Physical	13.64	12.0
- Mechanical	22.73	24.00
- Chemicals	18.18	20.00
- Physical & Chemicals	9.09	4.00
- Mekanis & Chemicals	13.64	8.00

Cocoa crop pest control data shows that non-partner farmers still tend to use chemicals to control plant pests of cocoa, while the partner farmers tend to use physical, mechanical or biological.

This indicates that the partner farmers have realized the danger of the use of synthetic chemicals in cocoa crop pest control. Farmers generally are still using chemical insecticides in controlling pests on cocoa plants.

The use of chemical insecticides that are not right will bring bad effects, more harm than benefit resulting, among others, could cause pest resistance, emergence of secondary pests, environmental pollution and product rejection due to a problem of residues exceeding the tolerance threshold [15].

The application of chemical insecticides / synthetic is only done if the percentage of cocoa borers attacks with heavy attacks that category had reached 40% [16].

Rats also an important pest in the cultivation of cocoa, other than cocoa pod borers, stem borers, and *Helopeltis* pest, because the rodents pest is very detrimental. Cocoa pods attacked by a rat would be hollow and will be damaged or rotten because of intruding rainwater and attack bacteria or fungi [17].

The research data shows that pest control of rats conducted more mechanical methods by partner farmers. VSD (vascular streak dieback) disease control conducted by partner and non-partner farmers generally use physical. Physical controls done by cutting diseased branches.

VSD disease control can be done by cutting the twigs/branches attacked by up to 30 cm in parts that are still healthy then fertilized using NPK fertilizer 1.5 times the recommended dose.

The VSD disease control can also be done by shape prunning and manufacture of drainage ditches [17].

Fruit rot disease on cocoa crop farmers generally controlled by the partners by way of technical culture and biologically.

Similarly, stem cancer more controlled by using a pesticide plant. This indicates that the partner farmers have reduced the use of chemicals in cocoa plant disease control.

Fruit rot disease control method is to combine the actions of sanitation, spraying fungicide, and improve the environment [18]. While controlling of stem cancer disease can be use botanical and chemical pesticides [12].

Reduction in the use of chemicals on cocoa crop disease control is one of the positive impact of the implementation of the partnership between the company and the cocoa farmers.

The most sustainable benefits of industrial partnership projects with cocoa farmers is the reduction of pesticide use and farmers' awareness of the importance of environmental health [19].

Table 5: The cocoa plant diseases control

Types of Diseases and Controlling	The number of farmers who applied (%)	
	Partnert	Partnert
Vascular Streak Dieback (VSD)		
- Not Applied	9.09	28.00
- Physical	90.91	72.00
Fruit rot disease		
- Not Applied	13.64	8.00
- Technical culture	18.18	4.00
- Mechanical	13.64	8.00
- Physical	13.64	16.00
- Biological	18.18	4.00
- Chemicals	9.09	24.00
- Mechanical & Chemicals	9.09	16.00
- Physical & Chemicals	4.55	16.00
- Technical culture & Chemicals	0.00	4.00
Stem cancer		
- Not Applied	22.73	40.00
- Chemicals	22.73	44.00
- Botanical pesticides	40.91	4.00
- Botanical pesticides & Chemicals	13.63	12.00

4. Conclusion

Partnerships of industrial with cocoa farmers in the development of the cocoa upstream industry in the region Luwu, an impact on the improvement of cocoa cultivation practices. Cocoa partnership activities have increased

the awareness of farmers in the use of quality seeds, application of monoculture cropping systems, and the application of the ideal planting distance. The used of cover crops, the right fertilizer and pruning activities have been implemented in cocoa partnership activities in the Luwu region. Another positive impact of the implementation of this cocoa partnership is a reduction in chemical use in pest and disease control cocoa plants. Partnership of industrial with cocoa farmers is expected to be upgraded to support the sustainability of cocoa farming.

Acknowledgements

The author wish to thank the Ministry of Research, technology and higher education that has provided funds in this research.

References

[1] A. Rachman. “Prospects for the Development Insightful Farming Agribusiness Through Partnership Part 5”. Internet: http://epetani.deptan.go.id. 2014. [Sep. 18, 2014].

[2] B.P. Bitzerd, Glasbergen and P. Leroy. “Partnerships of a feather flock together? An analysis of the emergence of networks of partnerships in the global cocoa sector.” Global Networks, vol. 12, pp. 355-374, Jun. 2012.

[3] C.O. Farayola, O.S. Akintaro, A.A. Yahaya and O.O. Oni. “Determinants of marketing efficiency among small-holder cocoa marketers in Oyo State, Nigeria.” International Journal of Management and Social Sciences Research, vol. 2, pp. 38-43, Nov. 2013.

[4] B. Rudito and M. Famiola. Social Mapping Method: Technic of an Understanding Society or Community. Bandung: Rekayasa Bisnis, 2008.

[5] L. Aklimawati and T. Wahyudi. “Estimated return volatility of cocoa prices using ARCH and GARCH Model.” Pelita Perkebunan, vol. 29, pp. 142-158, Aug. 2013.

[6] E Karmawati, Z. Mahmud, M. Syakir., S.J. Munarso, I.K.Ardana and Rubiyo. Cultivation and Postharvest of Cocoa. Bogor: Plantation Research and Development Center, 2010.

[7] I. Ali. “Analysis of the production and marketing of cocoa in the Gampong Tunong village Keumala District Pidie regency.” Agrisep, vol. 14, pp. 1-11, Dec. 2013.

[8] Pujiyanto and S. Abdoellah. “Fertilization,” in Complete Guide of Cocoa: Agribusiness Management from upstream to downstream. T. Wahyudi, T.R. Panggabean and Pujiyanto, Eds. Jakarta: Penebar Swadaya, 2008, pp. 133-137.

[9] M.O. Ogunlade and P.O. Aikpokpodion. “Available phosphorus and some micro-nutrient contents of cocoa soils in three cocoa growing ecological zones of Nigeria.” in Proc. 15th International Cocoa

Research Conference, 2006, pp. 55.

[10] M.O. Ogunlade, K.A. Oluyole and P.O. Aikpokpodion. "An Evaluation of the Level of Fertilizer Utilization for Cocoa Production in Nigeria." Journal of Human Ecology, vol. 25, pp. 175-178, Mar. 2009.

[11] A.A. Opeyemi, O.A. Fidelis, B. Ademola and O. Phillips. "Quality Management Practices in Cocoa Production in South-Western Nigeria." in Proc. Conference on International Research on Food Security, Natural Resource Management and Rural Development. 2005.

[12] Nasaruddin. Cocoa: Introduction of Clones, Rehabilitation, Revitalization and Intensification. Makassar: Masagena Press, 2012.

[13] Center for Agricultural Technology Assessment and Development. Cocoa Cultivation Technology. Bogor: The Center for Agricultural Technology Assessment and Development, 2008.

[14] Coffee and Cocoa Research Center of Indonesia. Complete Guide of Cocoa Cultivation. Jakarta: PT Agromedia Pustaka, 2004.

[15] Siswanto and E. Karmawati. "Control of cocoa main pest (Conopomorpha cramerella and Helopeltis spp.) using botanical pesticides and biological agents." Perspektif , vol. 11, pp. 103-112, Dec. 2012.

[16] Nurjanani, Ramlan and M. Asaad. "Assessment cocoa pod borers control using botanical pesticides and botanical pesticides rotation with synthetic pesticides on cocoa trees in South Sulawesi." in Proc. National Seminar on Agricultural Technology Innovation, 2013, pp. 431-440.

[17] Directorate General of Plantation Production Development, 2002. Natural Enemies, Pests and Diseases of Cocoa Plant. 2nd ed., Jakarta: Directorate General of Plantation Production Development, Agriculture Department, 2002, pp. 63.

[18] S. Sukamto. "Disease Control," in Complete Guide of Cocoa: Agribusiness Management from Upstream to Downstream. T. Wahyudi, T.R. Panggabean and Pujiyanto, Eds. Jakarta : Penebar Swadaya, 2008, pp. 154-169.

[19] B.O. Faturoti, M.C. Madukwe, O. Ogunedojutimi and L. Anyanwu. "Socioeconomic impact of SARO agro allied organic cocoa programme on beneficiary cocoa farmers in Nigeria." Journal of Agricultural Extension and Rural Development, vol. 4, pp. 435-445, Sep. 2012.